WHAT IS CLAIMED IS

1. A multi-level data processing method for converting a binary data into a multi-level data having n bits per symbol, where n is an integer satisfying $n \geqq 2$, comprising:

arranging a {(n - 1) x m}-bit binary data in upper (n - 1) bits of multi-level data of m symbols, where m is an integer satisfying $m \geqq 2$; and

converting a (m - k)-bit binary data into m bits according to a predetermined conversion rule and arranging the m bits in a lower 1 bit of the multi-level data of m symbols, where k is an integer satisfying $m > k \geqq 1$, so as to convert a (n x m - k)-bit binary data into 1 set of multi-level data made up of m symbols.

2. The multi-level data processing method as claimed in claim 1, wherein k = 2.

3. The multi-level data processing method as claimed in claim 1, further comprising:

relating data within other sets to the m bits when converting the (m - k)-bit binary data into the m bits.

4. The multi-level data processing method as claimed in claim 1, further comprising:

mixing to the multi-level data made up of the m symbols a test data which includes $2^{(M \times n)}$ combinations of M consecutive multi-level data, where M is an integer satisfying $M \geqq 3$.

5. The multi-level data processing method as claimed in claim 4, which reproduces multi-level data from a reproduced signal which is reproduced from an information recording medium which is recorded with a mixture of the multi-level data amounting to the m bits and the test data, comprising:

inputting the reproduced signal of the test data

and storing signal values of the multi-level data;

inputting the reproduced signal of the multi-level data which has been converted from the binary data;

calculating errors between the signal values of the multi-level data and the stored signal values;

outputting a multi-level data having a smallest error as a judging candidate of each symbol within one set as a first candidate, and outputting a multi-level data having a second smallest error as a second candidate;

generating a candidate of a multi-level data series of m symbols within one set according to the predetermined conversion rule, using the first and second candidates for each symbol;

calculating errors between the signal value of each symbol and stored signal values corresponding to the candidate multi-level data; and

outputting as a reproduced multi-level data a multi-level data series having a smallest total of the errors amounting to m symbols of one candidate.

6. A multi-level data processing apparatus

for converting a binary data into a multi-level data having n bits per symbol, where n is an integer satisfying $n \geqq 2$, comprising:

means for arranging a $\{(n - 1) \times m\}$-bit binary data in upper $(n - 1)$ bits of multi-level data of m symbols, where m is an integer satisfying $m \geqq 2$; and

means for converting a $(m - k)$-bit binary data into m bits according to a predetermined conversion rule and arranging the m bits in a lower 1 bit of the multi-level data of m symbols, where k is an integer satisfying $m > k \geqq 1$, so as to convert a $(n \times m - k)$-bit binary data into 1 set of multi-level data made up of m symbols.

7. The multi-level data processing apparatus as claimed in claim 6, wherein $k = 2$.

8. The multi-level data processing apparatus as claimed in claim 6, further comprising:

means for relating data within other sets to the m

bits when converting the (m - k)-bit binary data into the m bits.

9. The multi-level data processing apparatus as claimed in claim 6, further comprising:

means for mixing to the multi-level data made up of the m symbols a test data which includes $2^{(M \times n)}$ combinations of M consecutive multi-level data, where M is an integer satisfying $M \geqq 3$.

10. The multi-level data processing apparatus as claimed in claim 9, which reproduces multi-level data from a reproduced signal which is reproduced from an information recording medium which is recorded with a mixture of the multi-level data amounting to the m bits and the test data, comprising:

means for inputting the reproduced signal of the test data and storing signal values of the multi-level data;

means for inputting the reproduced signal of the multi-level data which has been converted from the binary data;

means for calculating errors between the signal values of the multi-level data and the stored signal values;

means for outputting a multi-level data having a smallest error as a judging candidate of each symbol within one set as a first candidate, and outputting a multi-level data having a second smallest error as a second candidate;

means for generating a candidate of a multi-level data series of m symbols within one set according to the predetermined conversion rule, using the first and second candidates for each symbol;

means for calculating errors between the signal value of each symbol and stored signal values corresponding to the candidate multi-level data; and

means for outputting as a reproduced multi-level data a multi-level data series having a smallest total of the errors amounting to m symbols of one candidate.

11. A multi-level data processing apparatus for converting a binary data into a multi-level data having n bits per symbol, where n is an integer satisfying $n \geqq 2$, comprising:

a section to arrange a {(n - 1) x m}-bit binary data in upper (n - 1) bits of multi-level data of m symbols, where m is an integer satisfying $m \geqq 2$; and

a section to convert a (m - k)-bit binary data into m bits according to a predetermined conversion rule and arranging the m bits in a lower 1 bit of the multi-level data of m symbols, where k is an integer satisfying $m > k \geqq 1$, so as to convert a (n x m - k)-bit binary data into 1 set of multi-level data made up of m symbols.

12. A multi-level data processing apparatus for converting a binary data into a multi-level data having n bits per symbol to be recorded on an information recording medium, where n is an integer satisfying $n \geqq 2$, comprising:

a section to arrange a {(n - 1) x m}-bit binary data in upper (n - 1) bits of multi-level data of m symbols, where m is an integer satisfying $m \geqq 2$;

a section to convert a (m - k)-bit binary data into m bits according to a predetermined conversion rule and arranging the m bits in a lower 1 bit of the multi-level data of m symbols, where k is an integer satisfying m > k $\geqq$ 1, so as to convert a (n x m - k)-bit binary data into 1 set of multi-level data made up of m symbols; and

a section to mix to the multi-level data made up of the m symbols a test data which includes $2^{(M \times n)}$ combinations of M consecutive multi-level data, where M is an integer satisfying M $\geqq$ 3, to be recorded on the information recording medium.

13. The multi-level data processing apparatus as claimed in claim 12, which reproduces multi-level data from a reproduced signal which is reproduced from the information recording medium which is recorded with the mixture of the multi-level data amounting to the m bits and the test data, comprising:

a section to input the reproduced signal of the test data and store signal values of the multi-level data;

a section to input the reproduced signal of the

multi-level data which has been converted from the binary data;

a section to calculate errors between the signal values of the multi-level data and the stored signal values;

a section to output a multi-level data having a smallest error as a judging candidate of each symbol within one set as a first candidate, and to output a multi-level data having a second smallest error as a second candidate;

a section to generate a candidate of a multi-level data series of m symbols within one set according to the predetermined conversion rule, using the first and second candidates for each symbol;

a section to calculate errors between the signal value of each symbol and stored signal values corresponding to the candidate multi-level data; and

a section to output as a reproduced multi-level data a multi-level data series having a smallest total of the errors amounting to m symbols of one candidate.